

US Route 1 – Overlea, MD Corridor Improvements

PREPARED FOR: Maryland Department of Transportation State Highway Administration

DATE: April 14, 2022

Executive Summary

Project Description

The US 1 corridor through Overlea, MD experiences several crashes per year, with segments of the corridor regularly on the Candidate Safety Improvement Sections List, including the latest 2019 list.

Crash data for US 1 from MP 15.76 to MP 16.26 shows the segment having twice the statewide rate for injury crashes and more than four times the statewide rate for pedestrian crashes.

Additionally, this area suffers from significant ADA accessibility issues, which will be addressed by relocation of utilities.

The Maryland Department of Transportation (MDOT), aims to improve the safety of those that use this vital corridor by installing new ADA compliant sidewalks and street crossings, improving intersections by adding new left-turn lanes and the construction of new two-way center left-turn lanes. Additionally, the project will restore the town's main street district with streetscape/landscape improvements.

As part of the RAISE Grant application, this project addresses the following selection criteria: Safety; Quality of Life; Mobility and Community Connectivity and State of Good Repair.

Currently, Baltimore County is implementing Phase 1 of the project, which will relocate the waterline underneath the roadway. Conclusion of the work is slated for 2027, sequentially followed by roadway and sidewalk improvements, during Phase 2. Completion of the project is slated for the middle of 2031.

This Benefit-Cost Analysis (BCA) assumes 28-year study period, 7 percent real discount rate, and 2020 base year. Table 1 provides a project matrix that summarizes the current conditions, changes resulting from the Project, and types of impacts.

Table 1. Project Matrix

Current Status/Baseline & Problem to be Addressed	Change to Baseline	Type of Impacts
Non-ADA-Compliant sidewalks and street crossings	New ADA Compliant Sidewalks and street crossings	Safety, Quality of Life, Mobility, Community Connectivity, State of Good Repair.
Dangerous non-protected left turns at intersections	Intersection Improvements with new left-turn lanes	Safety, Quality of Life, State of Good Repair.
Dangerous non-protected left turns across corridor	Two-way center left-turn lanes	Safety, Quality of Life, State of Good Repair.
Main Street in disrepair	Mainstreet streetscape/landscape Improvements	Safety, Quality of Life, Mobility, Community Connectivity, State of Good Repair.

Project Costs

Capital costs for the project are estimated to be \$47,587,000. Table 2 summarizes the cost items for the estimated capital costs. It is estimated that construction will start in 2023 and finish in 2031. Based on this construction schedule, the NPV for the capital costs is estimated to be \$27,575,459.

Table 2. Capital Costs

Cost Item	Amount
Preliminary Engineering	\$ 2,100,000
Utility Relocation Design	\$ 1,906,000
Right-of-Way Acquisition	\$ 5,641,000
Utility Relocation	\$ 9,532,000
Corridor Improvements	\$ 28,408,000
Total Costs	\$ 47,587,000
Net Present Value at 7%	\$ 27,575,459

Source: MDOT

Base Year = 2020

Based on MDOT's planning, funding for the project can be supported by multiple sources, including state, and federal sources. Table 3 summarizes estimated funding sources based on communication from MDOT. The estimated amount requested from US DOT RAISE Grants is \$15.34 Million, expressed in 2020 dollars.

Table 3. Project Funding Sources

Funding Source	Percent	Amount 2020 Dollars
Local Matching Funds (State and County)	32%	\$15.12M
RAISE Grant	32%	\$15.34M
NHPP	36%	\$17.13M
Total	100%	\$47.59

Source: MDOT

Benefit – Cost Analysis

The benefits of the Project comprise of ADA accessibility, implementation of operational safety improvements (to address higher than statewide average crash rates), and replacement/repair of aged roadway infrastructure. These benefits are quantified and Table 5 provides a summary of the benefits and costs for the Project. At a 7 percent real discount rate, the benefit cost ratio is 1.14 and the estimate net benefits is \$3.97 Million.

Table 5. Summary of Benefits and Costs

Benefits and Costs	NPV*
Benefits	
Sidewalk Extension	\$ 253,458
Signalized Crossing	\$ 1,943,176
Mortality Reduction due to Walking	\$ 4,729,639
Fatality Crash Reduction	\$ 11,234,020

Injury Crash Reduction	\$ 10,762,072
PDO Crash Reduction	\$ 280,500
Residual Assets	\$ 2,340,080
Total Benefits	\$ 30,041,863
Costs	
Preliminary Engineering	(\$ 1,408,910)
Utility Relocation Design	(\$ 1,310,069)
Right-of-Way Acquisition	(\$ 3,852,124)
Utility Relocation	(\$ 5,871,683)
Corridor Improvements	(\$ 15,132,673)
Total Costs	(\$ 27,575,459)
Net Benefits	\$ 3,967,485
Benefit/Cost Ratio	1.14

* 2020 base year and 7 percent real discount rate

Project Description

US Route 1 – Overlea, MD Corridor Improvements

The Project will provide infrastructure that is ADA compliant, while causing a reduction in crash frequencies and improve pedestrian travel. The Project construction is estimated to begin in 2023 and to be completed by 2031. The BCA assumes 28-year study period, 7 percent real discount rate, and 2020 base year.

Project Costs

Capital Costs

This section includes a review of the Capital costs associated with the project. These expenditures include Right-of-Way Acquisition, Utility Relocation and Corridor Improvements. These costs for the project are estimated to be \$47,587,000. Table 6 summarizes the cost items for the estimated capital costs. It is estimated that construction will start in 2023 and finish in 2031. Based on this construction schedule, the NPV for the capital costs is estimated to be \$27,575,459.

Previously incurred costs during early planning phases are not being considered as a part of this analysis, since they were incurred in 2016, which predates the analysis.

Table 6. Capital Costs

Cost Item	Amount
Preliminary Engineering	\$ 2,100,000
Utility Relocation Design	\$ 1,906,000
Right-of-Way Acquisition	\$ 5,641,000
Utility Relocation	\$ 9,532,000
Corridor Improvements	\$ 28,408,000
Total Costs	\$ 47,587,000
Net Present Value at 7%	\$ 27,575,459

Source: MDOT

Base Year = 2020

Based on Maryland DOT's planning, funding for the project can be supported by multiple sources, including local, state, and federal sources. Table 7 summarizes estimated funding sources based on construction estimates provided by Maryland DOT. The estimated amount requested from the RAISE Grant is \$15.34M, expressed in 2020 dollars.

Table 7. Project Funding Sources

Funding Source	Percent	Amount 2020 Dollars
State and County Matching Funds	32%	\$15.12M
RAISE Grant	32%	\$15.34M
NHPP	48%	\$17.13M
Total	100%	\$47.59

Project Benefits

Sidewalk Widening and Utility Relocation

A major aspect of the Corridor Improvement Project is to provide pedestrians with an ADA compliant and safe means of traveling through the area. Crash data for US 1 from MP 15.76 to MP 16.26 shows the segment having more than four times the statewide rate for pedestrian crashes.

The current sidewalks are extremely crowded with utilities and signs, forcing pedestrians to venture into the roadway and making passage of persons with mobility disability nearly non-existent. Using the US DOT BCA Guidance for 2022, a Demand & Benefit model was developed in order to understand the benefits to pedestrians by widening the sidewalks along the corridor to a uniform width of five feet. The number of daily pedestrian trips was determined based on data provided by MDOT and the value per person-mile for every foot of increased sidewalk width obtained from the US DOT BCA Guidance of 2022. Annual population growth factor representative of the region of 1.5% was utilized to determine the total number of pedestrian trips for the length of this analysis. Under guidance from US DOT BCA, the average pedestrian trip length utilized for this calculation is 0.86 miles.

Table 8 summarizes the benefits generated by widening the sidewalks along the corridor.

Table 8: Benefits Generated by Widening of Sidewalks

Regional Average Daily Pedestrian Trips	346 trips
Annual Pedestrian Trips	126,140 trips
Average Trip Length	0.86 mile
Total Person-Mile (Analysis Period)	4,588,560 person-mile
Increased Width of Sidewalks	3ft
Value per Person-Mile of Sidewalk Widening	\$ 0.30
Total Benefit of Sidewalk Extension	\$ 1,009,093
NPV	\$ 253,458

Installation of Signalized Crossings Along Corridor

As per the intended design, five intersections along the corridor will receive new signalized crossings. The installation of these signals provides a safety benefit to pedestrians of the area in the sum of \$0.46 per signal per person-mile.

Table 9 summarizes the benefits generated by installing signalized crossings along the corridor.

Table 9: Benefits Generated by Signalized Pedestrian Crossings

Regional Average Daily Pedestrian Trips	346 trips
Annual Pedestrian Trips	126,140 trips
Average Trip Length	0.86 mile
Total Person-Mile (Analysis Period)	4,588,560 person-mile
New Signalized Crossings	5
Value per Person-Mile of Sidewalk Widening	\$ 2.30
Total Benefit of Signalized Pedestrian Crossing	\$ 7,736,376
NPV	\$ 1,943,176

Crash data for US 1 from MP 15.76 to MP 16.26 shows the segment having twice the statewide rate for injury crashes. The reconfiguration of these five intersection geometries and the installation of traffic signals will also benefit drivers by providing safer travel along the corridor. The average avoided fatalities, injuries and PDO's for the corridor can be seen below on Table 10, alongside crash data

provided by the MDOT and their respective crash modification factors for the new intersections geometries. Table 11 summarizes the benefits to drivers of the reconfiguration of the five intersections

Table 10: Crash Data Along Corridor

Table 10: Crash Data Along Corridor

Crash Data									
Crash Data Period		5 years		Jan 01, 2017 to Dec 31, 2021		Maryland DOT - Office of Traffic and Safety			
Collision Types									
		Fatal	Injury	PDO	Total	Crash Modification Factor Traffic Signal	Average Avoided Fatalities per Year	Average Avoided Injuries per Year	Average Avoided PDOs per Year
Opposite Direction	Related	0	2	2	4	0.43	0.00	0.23	0.23
	Unrelated	0	1	4	5		0.00	0.11	0.46
Rear End	Related	0	21	51	72	1.427	0.00	-1.79	-4.36
	Unrelated	0	30	45	75		0.00	-2.56	-3.84
Sideswipe	Related	0	3	16	19	0.61	0.00	0.23	1.25
	Unrelated	0	11	53	64		0.00	0.86	4.13
Left Turn	Related	0	19	24	43	0.45	0.00	2.09	2.64
	Unrelated	0	3	5	8		0.00	0.33	0.55
Angle	Related	1	36	36	73	0.46	0.11	3.89	3.89
	Unrelated	0	12	13	25		0.00	1.30	1.40
Pedestrian	Related	0	9	0	9	1.12	0.00	-0.22	0.00
	Unrelated	0	4	0	4		0.00	-0.10	0.00
Parked Vehicle	Related	0	0	1	1	0.51	0.00	0.00	0.10
	Unrelated	0	1	6	7		0.00	0.10	0.59
Other	Related	0	1	1	2	0.51	0.00	0.10	0.10
	Unrelated	0	0	4	4		0.00	0.00	0.39
Total		1	153	261	415		0.108	4.567	7.526

Table 11 Benefits Generated by Signalizing Intersections

Average Avoided Fatalities per Year	0.108
Value per Fatality Crash Reduction	\$ 12,837,400
Total Benefit of Fatality Crash Reduction	\$ 44,726,061
NPV	\$ 11,234,020
Average Avoided Injuries per Year	4.567
Value per Injury Crash Reduction	\$ 302,600
Total Benefit of Injury Crash Reduction	\$ 42,847,094
NPV	\$ 10,762,072
Average Avoided PDO per Year	7.526
Value per PDO Crash Reduction	\$ 4,600
Total Benefit of PDO Crash Reduction	\$ 1,116,757
NPV	\$ 280,500
Total Benefit Generated by Signalizing Intersections	\$ 88,689,912
NPV	\$ 22,276,593

Health Benefits

The use of active transportation such as walking is rewarded as a benefit to society for the RAISE Grant application. Due to the high rate of accidents, the narrowness of the available pathways and the disrepair of the Main Street area along the corridor, pedestrian traffic has been in a steady decline over the years. Utilizing RAISE Grant BCA Guidance for 2022 and projected pedestrian data at completion of the project, provided by MDOT, the health benefits associated with active transportation mode has been determined and shown on Table 12.

Table 12: Benefits Generated by Increased Access to Walking

Regional Average Daily Recreational Pedestrian Trips	346 trips
Annual Recreational Pedestrian Trips	126,140 trips
Value Per Induced Trip	\$ 7.08 [2020USD/Trip]
Total Health Benefit	\$ 18,830,136
NPV	\$ 4,729,639

Residual Value

Residual value is the estimated value of the project at the end of the study period and represents a depreciated value of the assets that are expected to continue to provide benefits after the end of the study period. Residual value is estimated based on US DOT 2020 BCA guidance (Project Study Period / Project Life * Capital Costs). A 35-year project life is assumed and the Project Study Period is 20 years. Residual value is estimated at the end of the study period and is included as a benefit. The estimated residual value in 2052 is estimated to be approximately \$20.4 Million. Assuming a 2020 base year and 7 percent real discount rate, the NPV is estimated to be \$2.34 Million. Table 13 summarizes the findings from the residual value calculation.

Table 13: Residual Value

Project Lifespan	35 years
Time between commission & end of analysis	20 years
Depreciation per Year	\$ 1,083,988
Total Depreciation	\$ 27,192,571
Remaining Capital Value	\$ 20,394,429
NPV Remaining Capital	\$ 2,340,080

Summary of Benefits and Costs

The benefits of the Project comprise ADA compliance, reduction in crash frequencies and improve pedestrian travel and safety. Table 14 provides a summary of the benefits and costs for the Project. At a 7 percent real discount rate, the benefit cost ratio is 1.14 and the estimate net benefits is \$3.97 Million. Table 15 provides summary of the discounted cash flow for costs and benefits.

Table 14. Summary of Benefits and Costs

Benefits and Costs	NPV
Benefits	
Sidewalk Extension	\$ 253,458
Signalized Crossings	\$ 1,943,176
Mortality Reduction due to Walking	\$ 4,729,639
Fatality Crash Reduction	\$ 11,234,020

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Injury Crash Reduction	\$ 10,762,072
PDO Crash Reduction	\$ 280,500
Residual Assets	\$ 2,340,080
Total Benefits	\$ 31,542,945
Costs	
Preliminary Engineering	(\$ 1,408,910)
Utility Relocation Design	(\$ 1,310,069)
Right-of-Way Acquisition	(\$ 3,852,124)
Utility Relocation	(\$ 5,871,683)
Corridor Improvements	(\$ 15,132,673)
Total Costs	(\$ 27,575,459)
Net Benefits	\$ 3,967,485
Benefit/Cost Ratio	1.14

* 2020 base year and 7 percent real discount rate

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Table 15: Cash Flow Summary

Projected Cash Flow																		
Period	Year	Discount Factor	Preliminary Engineering	Utility Relocation Design	ROW Acquisition	Utility Relocation	Corridor Improvements	Total Costs	Discounted Costs	Sidewalk Extension	Signalized Crossings	Mortality Reduction due to Walking	Fatality Crash Reduced	Injury Crash Reduced	PDO Crash Reduced	Residual Assets	Total Benefits	Discounted Benefits
0	2020	1.000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
1	2021	0.935	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2	2022	0.873	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
3	2023	0.816	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
4	2024	0.763	\$ (525,000)	\$ -	\$ -	\$ -	\$ -	\$ (525,000)	\$ (400,520)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
5	2025	0.713	\$ (420,000)	\$ (858,000)	\$ (2,000,000)	\$ -	\$ -	\$ (3,278,000)	\$ (2,337,169)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
6	2026	0.666	\$ (378,000)	\$ (1,048,000)	\$ (3,641,000)	\$ (3,336,000)	\$ -	\$ (8,403,000)	\$ (5,599,274)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
7	2027	0.623	\$ (315,000)	\$ -	\$ -	\$ (2,383,000)	\$ -	\$ (2,698,000)	\$ (1,680,179)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
8	2028	0.582	\$ (252,000)	\$ -	\$ -	\$ (2,383,000)	\$ (8,522,000)	\$ (11,157,000)	\$ (6,493,476)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
9	2029	0.544	\$ (210,000)	\$ -	\$ -	\$ (1,430,000)	\$ (7,102,000)	\$ (8,742,000)	\$ (4,755,069)	\$ 9,303	\$ 71,320	\$ 173,591	\$ 412,321	\$ 394,999	\$ 10,295	\$ -	\$ 1,071,830	\$ 583,004
10	2030	0.508	\$ -	\$ -	\$ -	\$ -	\$ (7,102,000)	\$ (7,102,000)	\$ (3,610,297)	\$ 18,884	\$ 144,780	\$ 352,391	\$ 837,012	\$ 801,849	\$ 20,899	\$ -	\$ 2,175,815	\$ 1,106,074
11	2031	0.475	\$ -	\$ -	\$ -	\$ -	\$ (5,682,000)	\$ (5,682,000)	\$ (2,699,477)	\$ 28,751	\$ 220,428	\$ 536,515	\$ 1,274,351	\$ 1,220,814	\$ 31,819	\$ -	\$ 3,312,678	\$ 1,573,829
12	2032	0.444	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 38,910	\$ 298,312	\$ 726,083	\$ 1,724,621	\$ 1,652,169	\$ 43,062	\$ -	\$ 4,483,157	\$ 1,990,575
13	2033	0.415	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 39,494	\$ 302,787	\$ 736,975	\$ 1,750,490	\$ 1,676,951	\$ 43,708	\$ -	\$ 4,550,404	\$ 1,888,256
14	2034	0.388	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 40,086	\$ 307,328	\$ 748,029	\$ 1,776,748	\$ 1,702,106	\$ 44,363	\$ -	\$ 4,618,661	\$ 1,791,196
15	2035	0.362	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 40,688	\$ 311,938	\$ 759,250	\$ 1,803,399	\$ 1,727,637	\$ 45,029	\$ -	\$ 4,687,940	\$ 1,699,125
16	2036	0.339	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 41,298	\$ 316,617	\$ 770,638	\$ 1,830,450	\$ 1,753,552	\$ 45,704	\$ -	\$ 4,758,260	\$ 1,611,787
17	2037	0.317	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 41,917	\$ 321,367	\$ 782,198	\$ 1,857,907	\$ 1,779,855	\$ 46,390	\$ -	\$ 4,829,633	\$ 1,528,938
18	2038	0.296	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 42,546	\$ 326,187	\$ 793,931	\$ 1,885,775	\$ 1,806,553	\$ 47,086	\$ -	\$ 4,902,078	\$ 1,450,348
19	2039	0.277	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 43,184	\$ 331,080	\$ 805,840	\$ 1,914,062	\$ 1,833,651	\$ 47,792	\$ -	\$ 4,975,609	\$ 1,375,797
20	2040	0.258	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 43,832	\$ 336,046	\$ 817,928	\$ 1,942,773	\$ 1,861,156	\$ 48,509	\$ -	\$ 5,050,243	\$ 1,305,079
21	2041	0.242	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 44,490	\$ 341,087	\$ 830,196	\$ 1,971,914	\$ 1,889,073	\$ 49,236	\$ -	\$ 5,125,997	\$ 1,237,995
22	2042	0.226	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 45,157	\$ 346,203	\$ 842,649	\$ 2,001,493	\$ 1,917,409	\$ 49,975	\$ -	\$ 5,202,887	\$ 1,174,360
23	2043	0.211	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 45,834	\$ 351,396	\$ 855,289	\$ 2,031,516	\$ 1,946,170	\$ 50,725	\$ -	\$ 5,280,930	\$ 1,113,996
24	2044	0.197	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 46,522	\$ 356,667	\$ 868,118	\$ 2,061,988	\$ 1,975,363	\$ 51,485	\$ -	\$ 5,360,144	\$ 1,056,734
25	2045	0.184	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 47,220	\$ 362,017	\$ 881,140	\$ 2,092,918	\$ 2,004,993	\$ 52,258	\$ -	\$ 5,440,546	\$ 1,002,416
26	2046	0.172	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 47,928	\$ 367,447	\$ 894,357	\$ 2,124,312	\$ 2,035,068	\$ 53,042	\$ -	\$ 5,522,154	\$ 950,890
27	2047	0.161	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 48,647	\$ 372,959	\$ 907,773	\$ 2,156,177	\$ 2,065,594	\$ 53,837	\$ -	\$ 5,604,987	\$ 902,013
28	2048	0.150	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 49,377	\$ 378,554	\$ 921,389	\$ 2,188,519	\$ 2,096,578	\$ 54,645	\$ -	\$ 5,689,062	\$ 855,647
29	2049	0.141	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 50,117	\$ 384,232	\$ 935,210	\$ 2,221,347	\$ 2,128,027	\$ 55,464	\$ -	\$ 5,774,397	\$ 811,666
30	2050	0.131	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 50,869	\$ 389,995	\$ 949,238	\$ 2,254,667	\$ 2,159,947	\$ 56,296	\$ -	\$ 5,861,013	\$ 769,944
31	2051	0.123	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 51,632	\$ 395,845	\$ 963,477	\$ 2,288,487	\$ 2,192,347	\$ 57,141	\$ -	\$ 5,948,929	\$ 730,368
32	2052	0.115	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 52,406	\$ 401,783	\$ 977,929	\$ 2,322,814	\$ 2,225,232	\$ 57,998	\$ 20,394,429	\$ 26,432,591	\$ 3,032,905